AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (original): A reverse rotation preventing electronic cam curve generating method of an electronic cam type rotary cutter control which prevents a reverse rotation of a rotary cutter when a cutting length is great,

wherein a critical cutting length L_{jag} from which an electronic cam curve passing through a point having an acceleration of 0 and a speed of 0 is obtained is previously calculated by setting a rotor diameter r of the rotary cutter, the number of blades M provided at regular intervals on a rotor, synchronizing speed coefficients β_1 and β_2 for regulating synchronizing speeds in cutting, and synchronizing angles θ_1 and θ_2 and is compared with a set cutting length L_{set} of a processed product which is set by an operator, and an electronic cam curve pattern for preventing a reverse rotation is generated to carry out a reverse rotation preventing control when the set cutting length L_{set} is greater.

2. (original): The reverse rotation preventing electronic cam curve generating method of an electronic cam type rotary cutter control according to claim 1, wherein the critical cutting length L_{jag} is obtained by an equation of :

$$\theta_{cut} = \frac{2\pi}{M}$$

$$L_{jag} = r\frac{\theta_{cut} - \theta_1 - \theta_2 + \left\{\frac{3}{8}(\beta_1 + \beta_2) - \frac{1}{4}\sqrt{\beta_1\beta_2}\right\}\cdot\left(\frac{\theta_1}{\beta_1} + \frac{\theta_2}{\beta_2}\right)}{\frac{3}{8}(\beta_1 + \beta_2) - \frac{1}{4}\sqrt{\beta_1\beta_2}}$$

where r is a rotor diameter, M is the number of blades, β_1 and β_2 are the synchronizing speed coefficients, andθ_1 and θ_2 are the synchronizing angles.

3. (original): The reverse rotation preventing electronic cam curve generating method of an electronic cam type rotary cutter control according to claim 1 or 2, wherein when a result of the comparison of the critical cutting length L_{jag} with the set cutting length L_{set} is $L_{jag} > L_{set}$ or $L_{jag} < L_{set}$, an electronic cam curve pattern for preventing a reverse rotation is created by setting the following parameter:

when $L_{jag} > L_{set}$ is set as,

$$T_{12} = \frac{T_C - T_{01} - T_{45}}{2}$$

$$T_{23} = 0$$

$$T_{34} = \frac{T_C - T_{01} - T_{45}}{2}$$

$$\omega_1 = \frac{2\pi}{T_{12} + T_{34}}$$

$$\omega_2 = \frac{\pi}{T_{12} + T_{34}}$$

$$A = A$$

and

when $L_{jag} < L_{set}$ is set as,

$$\omega_1 = \frac{2\pi}{T_{jag}}$$

$$\omega_2 = \frac{\pi}{T_{jag}}$$

$$T_{12} = \frac{\pi - \alpha}{\omega_2}$$

$$T_{34} = T_{jag} - T_{12}$$

$$T_{23} = T_C - T_{01} - T_{12} - T_{34} - T_{45}$$

$$A = A_{jag}$$

4. (original): The reverse rotation preventing electronic cam curve generating method of an electronic cam type rotary cutter control according to claim 3, wherein correction coefficients A and A_{jag} of a speed function and a position function, T_{jag} corresponding to L_{jag}, and a stop phase angle α are obtained as the correction coefficient A_{jag} for generating an electronic cam curve passing through a point having an acceleration of 0 and a speed of 0 such as,

$$A_{jag} = -V_L\left(\frac{\beta_1 + \beta_2}{8r} + \frac{\sqrt{\beta_1\beta_2}}{4r}\right)$$

the correction coefficient A from a cutting length set to an operation panel,

$$A = V_L \frac{\theta_{cut} - \theta_1 - \theta_2 - \frac{\beta_1 + \beta_2}{2r}\left(L_{set} - \frac{r\theta_1}{\beta_1} - \frac{r\theta_2}{\beta_2}\right)}{L_{set} - \frac{r\theta_1}{\beta_1} - \frac{r\theta_2}{\beta_2}}$$

, and

T_{jag} • α when a value set to L_{set} is equal to L_{jag} from the following equation;

$$T_{jag} = \frac{L_{jag} - r\left(\frac{\theta_1}{\beta_1} + \frac{\theta_2}{\beta_2}\right)}{V_L}$$

$$\alpha = \mathrm{Tan}^{-1}\left\{\frac{\sqrt{\left(\beta_1 + \beta_2 + 2\sqrt{\beta_1\beta_2}\right)^2 - (\beta_1 - \beta_2)^2}}{\beta_1 - \beta_2}\right\}.$$

5. (currently amended): The reverse rotation preventing electronic cam curve generating method of an electronic cam type rotary cutter control according to ~~any of~~ claims 1 ~~to~~ [[4]], wherein the electronic cam curve divides one cutting and control cycle to be a reference into a large number of sections, and a speed function pattern and a position function pattern which are represented by an approximate equation through a trigonometric function for each of the sections are calculated in an identical algorithm respectively and a whole synthesis and generation is carried out.

6. (original): The reverse rotation preventing electronic cam curve generating method of an electronic cam type rotary cutter control according to claim 2, wherein the critical cutting length L_{jag} is determined by one calculation.

7. (original): An electronic cam type rotary cutter control apparatus having a counter for pulse counting an amount of movement of a workpiece from a measure roll PG of a mechanical apparatus including a measure roll, a cutter roll and a feed roll and serving to carry out a work for cutting the workpiece, a differentiating circuit for differentiating the count value to calculate a moving speed of the workpiece and to output the moving speed to a multiplier, thereby constituting a feedforward, a triangular wave generator for converting the count value

into a triangular wave having an amplitude in a certain amount, a speed function generator for generating a cam curve speed pattern by a correction output of the triangular wave generator, a position function generator for generating a cam curve position pattern from the correction output of the triangular wave generator, a position loop constituting a feedback control based on the correction output of the position function generator and an amount of movement of a motor, and a speed controller for A/D converting and inputting a speed feedforward output of the multiplier and an output of the position loop and reading a value of the motor PG, thereby controlling a speed of the motor, and serving to prevent a reverse rotation of a rotary cutter when a cutting length of the workpiece is great, the apparatus comprising an electronic cam curve parameter setting unit having an operator unit for inputting a set cutting length L_{set} to a comparator and a cutter roll radius r, the number of blades M, synchronizing speed coefficients β_1 and β_2 and synchronizing angles θ_1 and θ_2 to a first calculator, the first calculator for calculating a critical cutting length L_{jag} based on a value input from the operator unit, the comparator for comparing the cutting length L_{jag} thus calculated with the set cutting length L_{set}, a second calculator for setting A = A and calculating and outputting each of parameters of T_{12}, T_{23}, T_{34}, ω_1 and ω_2 in case of $L_{jag} > L_{set}$ and setting $A = A_{jag}$ and calculating and outputting each of the parameters of ω_1, ω_2, T_{12}, T_{34} and T_{23} in case of $L_{jag} < L_{set}$ based on a result of the comparison carried out by the comparator, and a setting unit for carrying out a write to the speed function generator and the position function generator in order to generate an electronic cam curve for preventing a reverse rotation based on each of the parameters output from the second calculator.

8. (new): An electronic cam curve generating method comprising:

obtaining a critical cutting length L_{jag} from which an electronic cam curve passing through a point having an acceleration of 0 and a speed of 0; and

generating an electronic cam curve pattern for preventing a reverse rotation o carry out a reverse rotation preventing control when the set cutting length L_{set} is greater than a predetermined value;

the critical length L_{jag} being obtained by a sub-process comprising:

setting a rotor diameter r of the rotary cutter;

providing the number of blades M at regular intervals on a rotor;

synchronizing speed coefficients β_1 and β_2 for regulating synchronizing speeds in cutting, and synchronizing angles θ_1 and θ_2 and

comparing with a set cutting length L_{set} of a processed product which is set by an operator.

9. (new): The electronic cam curve generating method of claim 8 wherein the critical cutting length L_{jag} is obtained by an equation of :

$$\theta_{cut} = \frac{2\pi}{M}$$

$$L_{jag} = r\frac{\theta_{cut} - \theta_1 - \theta_2 + \left\{\frac{3}{8}(\beta_1 + \beta_2) - \frac{1}{4}\sqrt{\beta_1\beta_2}\right\}\cdot\left(\frac{\theta_1}{\beta_1} + \frac{\theta_2}{\beta_2}\right)}{\frac{3}{8}(\beta_1 + \beta_2) - \frac{1}{4}\sqrt{\beta_1\beta_2}}$$

where r is a rotor diameter, M is the number of blades, β_1 and β_2 are the synchronizing speed coefficients, andθ_1 and θ_2 are the synchronizing angles.

10. (new): The electronic cam curve generating method of claim 8 wherein when a result of the comparison of the critical cutting length L_{jag} with the set cutting length L_{set} is $L_{jag} > L_{set}$ or $L_{jag} < L_{set}$, an electronic cam curve pattern for preventing a reverse rotation is created by setting the following parameter:

when $L_{jag} > L_{set}$ is set as,

$$T_{12} = \frac{T_C - T_{01} - T_{45}}{2}$$

$$T_{23} = 0$$

$$T_{34} = \frac{T_C - T_{01} - T_{45}}{2}$$

$$\omega_1 = \frac{2\pi}{T_{12} + T_{34}}$$

$$\omega_2 = \frac{\pi}{T_{12} + T_{34}}$$

$$A = A$$

and

when $L_{jag} < L_{set}$ is set as,

$$\omega_1 = \frac{2\pi}{T_{jag}}$$

$$\omega_2 = \frac{\pi}{T_{jag}}$$

$$T_{12} = \frac{\pi - \alpha}{\omega_2}$$

$$T_{34} = T_{jag} - T_{12}$$

$$T_{23} = T_C - T_{01} - T_{12} - T_{34} - T_{45}$$

$$A = A_{jag}$$

11. (new): The electronic cam curve generating method of claim 3, wherein correction coefficients A and A_{jag} of a speed function and a position function, T_{jag} corresponding to L_{jag}, and a stop phase angle α are obtained as the correction coefficient A_{jag} for generating an electronic cam curve passing through a point having an acceleration of 0 and a speed of 0 such as,

$$A_{jag} = -V_L\left(\frac{\beta_1+\beta_2}{8r}+\frac{\sqrt{\beta_1\beta_2}}{4r}\right)$$

the correction coefficient A from a cutting length set to an operation panel,

$$A = V_L\frac{\theta_{cut}-\theta_1-\theta_2-\frac{\beta_1+\beta_2}{2r}\left(L_{set}-\frac{r\theta_1}{\beta_1}-\frac{r\theta_2}{\beta_2}\right)}{L_{set}-\frac{r\theta_1}{\beta_1}-\frac{r\theta_2}{\beta_2}}$$

,and

$T_{jag} \bullet \alpha$ when a value set to L_{set} is equal to L_{jag} from the following equation;

$$T_{jag} = \frac{L_{jag}-r\left(\frac{\theta_1}{\beta_1}+\frac{\theta_2}{\beta_2}\right)}{V_L}$$

$$\alpha = \mathrm{Tan}^{-1}\left\{\frac{\sqrt{\left(\beta_1+\beta_2+2\sqrt{\beta_1\beta_2}\right)^2-(\beta_1-\beta_2)^2}}{\beta_1-\beta_2}\right\}.$$

12. (new): The electronic cam curve generating method according to claim 8, wherein the electronic cam curve divides one cutting and control cycle to be a reference into a large number of sections, and a speed function pattern and a position function pattern which are represented by an approximate equation through a trigonometric function for each of the sections

are calculated in an identical algorithm respectively and a whole synthesis and generation is carried out.

13. (new): The electronic cam curve generating method according to claim 9, wherein the critical cutting length L_{jag} is determined by one calculation.

14. (new): An electronic cam type rotary cutter control apparatus comprising:

a counter operable to pulse count an amount of movement of a workpiece from a measure roll PG of a mechanical apparatus including a measure roll,

a cutter roll and a feed roll operable to serve to carry out a work for cutting the workpiece,

a differentiating circuit operable to differentiate the count value to calculate a moving speed of the workpiece and to output the moving speed to a multiplier, thereby constituting a feedforward;

a triangular wave generator operable to convert the count value into a triangular wave having an amplitude in a certain amount,

a speed function generator operable to generate a cam curve speed pattern by a correction output of the triangular wave generator,

a position function generator operable to generate a cam curve position pattern from the correction output of the triangular wave generator,

a position loop constituting a feedback control based on the correction output of the position function generator and an amount of movement of a motor,

a speed controller operable to perform A/D converting and inputting a speed feedforward output of the multiplier and an output of the position loop and reading a value of the motor PG, thereby controlling a speed of the motor,

an electronic cam curve parameter setting unit having an operator unit operable to input a set cutting length L_{set} to a comparator and a cutter roll radius r, the number of blades M, synchronizing speed coefficients β_1 and β_2 and synchronizing angles θ_1 and θ_2 to a first calculator,

the first calculator operable to calculate a critical cutting length L_{jag} based on a value input from the operator unit,

the comparator operable to compare the cutting length L_{jag} thus calculated with the set cutting length L_{set},

a second calculator operable to set A = A and calculate and output each of parameters of T_{12}, T_{23}, T_{34}, ω_1 and ω_2 in case of $L_{jag} > L_{set}$ and setting $A = A_{jag}$ and calculate and output each of the parameters of ω_1, ω_2, T_{12}, T_{34} and T_{23} in case of $L_{jag} < L_{set}$ based on a result of the comparison carried out by the comparator, and

a setting unit operable to carry out a write to the speed function generator and the position function generator in order to generate an electronic cam curve for preventing a reverse rotation based on each of the parameters output from the second calculator.